

CLAIMS

I claim:

- 1 1). A method, comprising:
 - 2 using hardware and software to perform continuous edge profiling on a
 - 3 program;
 - 4 detecting profile phase transitions continuously; and
 - 5 optimizing the program based upon the profile phase transitions and edge
 - 6 profile.
- 1 2). The method of claim 1, wherein using hardware and software
 - 2 comprises:
 - 3 using software to insert edge profiling instructions and arrange profile
 - 4 data;
 - 5 executing the program; and
 - 6 using hardware to update profile, and signal phase transitions.
- 1 3). The method of claim 2, wherein using software to insert profiling
 - 2 instructions comprises modifying branch instructions to assign an identifier
 - 3 to one or more profiled edges, and to assign a value to an edge selection field.
- 1 4). The method of claim 3, wherein using software to insert profiling instructions
 - 2 further comprises inserting a profile identifier instruction when the profiled edge

3 does not have a branch instruction; an initialize profile instruction; and a set
4 offset instruction.

1 5). The method of claim 2, wherein using hardware comprises translating edge
2 profiling instructions into profile update operations.

1 6). The method of claim 4, further comprising:
2 loading a profile information register with a base address, an offset value,
3 a trigger-counter, and a flag.

1 7). The method of claim 5, further comprising:
2 intercepting with hardware the profiling instructions;
3 generating a profile update operation; and
4 updating profile counters.

1 8). The method of claim 1, wherein detecting profile phase transitions
2 continuously, comprises generating an interrupt signal by the hardware when the
3 profile phase transition occurs.

1 9). The method of claim 8, further comprising:
2 determining if a program edge is hot, comprising
3 determining if the profiling instruction is executed, and

4 updating profiling counters associated with the profiling instruction;
5 determining if a cold edge becomes a hot edge, comprising
6 incrementing and decrementing trigger counters, and
7 detecting if trigger counters overflow and underflow;
8 preventing a false phase transition by detecting trigger counters underflow.

1 10). A system, comprising:
2 a processor pipeline configured to generate a profile ID for each profiled edge,
3 and generate profile update operations;
4 a profile information register coupled to the processor pipeline;
5 a first logic device configured to accept the profile update operations and profile
6 ID to generate a memory buffer address;
7 a profile cache for accepting the buffer address connected to the first logic
8 device; and
9 a second logic device connected to the profile cache configured to generate a
10 phase transition interrupt signal,
11 wherein the system performs edge profiling on a program, detects profile phase
12 transitions continuously, and optimizes the program based upon the profile
13 phase transitions.

1 11). The system of claim 10, wherein the processor pipeline
2 executes the program;

3 intercepts profiling instructions and updates profile counters; and
4 updates profile phase transition trigger counters, and
5 signals phase transitions.

1 12). The system of claim 11, wherein the software inserts edge profiling
2 instructions for modifying branch instructions to assign an identifier to one or
3 more profiled edges, and to assign a value to an edge selection field.

1 13). The system of claim 12, wherein the software while inserting edge profiling
2 instructions, also inserts a profile identifier instruction when the profiled edge
3 does not have a branch instruction; an initialize profile instruction; and a set
4 offset instruction.

1 14). The system of claim 11, wherein the processor translates edge profiling
2 instructions into profile update operations.

1 15). The system of claim 13, wherein the processor pipeline loads a profile
2 information register with a base address, an offset value, a trigger-counter,
3 and a flag.

1 16). The system of claim 14, wherein the processor pipeline:
2 intercepts the profiling instructions;

3 generates a profile update operation; and
4 updates profile counters.

1 17). The system of claim 10, wherein the logic device generates an interrupt
2 signal when the profile phase transition occurs.

1 18). The system of claim 17, wherein the processor:
2 determines if a program edge is hot, by determining if the profiling instruction is
3 executed, updating profile counters associated with the profiling instruction,
4 and determining if the trigger counters overflow;
5 determines if a cold edge becomes a hot edge, comprising
6 incrementing and decrementing trigger counters, and
7 detecting if trigger counters overflow and underflow;
8 preventing a false phase transition by detecting trigger counters underflow.

1 19). A computer-readable medium having stored thereon a plurality of
2 instructions, said plurality of instructions when executed by a computer, cause
3 said computer to perform:
4 using hardware and software to perform continuous edge profiling on a
5 program;
6 detecting profile phase transitions continuously; and

7 optimizing the program based upon the profile phase transitions and edge
8 profile.

1 20). The computer-readable medium of claim 19 having stored thereon
2 additional instructions, said additional instructions when executed by a
3 computer for using hardware and software to perform edge profiling on a
4 program, cause said computer to further perform:

5 using software to insert edge profiling instructions and arrange
6 profile data;
7 executing the program; and
8 using hardware to update profile phase transitions, and signal
9 phase transitions.

1 21). The computer-readable medium of claim 20 having stored thereon
2 additional instructions, said additional instructions when executed by a
3 computer for using software to insert edge profiling instructions, cause said
4 computer to further perform:
5 modifying branch instructions to assign an identifier to one or more
6 profiled edges, and to assign a value to an edge selection field.

1 22). The computer-readable medium of claim 21 having stored thereon
2 additional instructions, said additional instructions when executed by a

3 computer for using software to insert edge profiling instructions, cause said
4 computer to further perform:
5 inserting a profile identifier instruction; when the profiled edge does
6 not have a branch instruction, an initialize profile instruction, and
7 a set offset instruction.

1 23). The computer-readable medium of claim 20, having stored thereon
2 additional instructions, said additional instructions when executed by a
3 computer for using hardware, cause said computer to further perform
4 translating edge profiling instructions into profile update operations.

1 24). The computer-readable medium of claim 22 having stored thereon
2 additional instructions, said additional instructions when executed by a
3 computer, cause said computer to further perform:
4 loading a profile information register with a base address, an offset
5 value, a trigger-counter, and a flag.

1 25). The computer-readable medium of claim 23 having stored thereon
2 additional instructions, said additional instructions when executed by a
3 computer, cause said computer to further perform:
4 intercepting with the hardware the profiling instructions;
5 generating a profile update operation; and

6 updating profile counters.

1 26). The computer-readable medium of claim 19 having stored thereon
2 additional instructions, said additional instructions when executed by a
3 computer for detecting profile phase transitions continuously, cause said
4 computer to further perform:

5 generating an interrupt signal by the hardware when the profile phase
6 transition occurs.

1 27). The computer-readable medium of claim 26 having stored thereon
2 additional instructions, said additional instructions when executed by a
3 computer for detecting profile phase transitions continuously, cause said
4 computer to further perform:

5 determining if a program edge is hot, comprising
6 determining if the profiling instruction is executed, and
7 updating profile counters associated with the profiling instruction;
8 determining if a cold edge becomes a hot edge, comprising
9 incrementing or decrementing trigger counters, and
10 detecting if trigger counters overflow and underflow;
11 preventing a false phase transition by detecting trigger counters
12 underflow.